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Does International Aid to Education Improve Education Outcomes?

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Does International Aid to Education Improve Education Outcomes?

by

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Dedication

I would like to dedicate this report to my Dad who consistently reminds that this is all one grand adventure, even when it doesn't feel like it.

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Abstract

Does International Aid to Education Improve Education Outcomes?

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Between 2000 and 2012, nearly US$161 billion in international aid was allocated to the education sector. As the deadline for the Millennium Development Goals quickly approaches, debate about the effectiveness of international donors and aid in general continues across sectors. With 58 million children still out of school and persistent gender disparities across all levels of schooling, education is no exception to this scrutiny. The central question in this report seeks to understand if international aid to the education is positively related to education outcomes in low and low-middle income countries. I provide a summary of progress in education in developing countries over the last two decades and a description of trends in international aid to the education sector. In an empirical analysis of 135 countries between 1990 and 2010, I find that aid to primary education is positively related to primary school enrollment for boys and girls. Using the findings from the analysis, I offer policy recommendations to improve international donor effectiveness in the education sector. Through this report, I hope to contribute to the conversation related to education and international aid in post-2015 Sustainable Development Goal agendas and strategies.

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"There can be no credible global development framework without the right to education at its core. Education is a public good and a basic right"
– Education International

Chapter 1: Overview of International Education

Education is widely considered to be a critical input for both human capital development and poverty alleviation. This notion has attracted substantial resources to education in developing countries from international donors. Between 2000 and 2012, nearly US$161 billion in international aid has flowed to education (AidData Dashboard, 2015). Of this aggregate aid to education, over US$45 billion has been targeted specifically to the primary education level (AidData Dashboard, 2015). Over the past two decades, we have seen significant improvements in educational attainment and human capital development across the globe. New policies, campaigns, and resources dedicated to progress in education have contributed to these positive changes. Despite significant growth, many of the world's poorest countries still face significant challenges in access to and quality of education services (Benavot, 2010). Even with significant improvements in enrollment and completion, many children still lack the basic literacy and numeracy skills necessary to constitute meaningful improvements in human capital. This is particularly for true for young girls in many countries.

The upcoming conclusion of the Millennium Development Goals (MDGs) and ongoing conversations related to the post-2015 Sustainable Development Goals (SDGs) has revived debates about the effectiveness of international aid across sectors. The driving question this report seeks to understand is whether international aid to the

education sector has contributed to advancements in education outcomes in low and low-middle-income countries for boys and girls. Chapter 1 outlines the education targets set in the MDGs and the status of education in the developing world today. Chapter 2 discusses recent trends and issues related to international aid to the education sector. Chapter 3 provides an empirical analysis of the relationship between international aid to education and MDG education outcomes in low and low-middle-income countries over the last two decades. Chapter 4 summarizes lessons learned and policy recommendations for the post-2015 SDGs as they relate to education. Through this report, I hope to contribute to our understanding of how international aid has related to education outcomes thus far and provide a timely insight into potential policy solutions as we move into the next phase of education and development planning.

I. Status of education in developing countries

Millennium Development Goals

The Millennium Development Goals, established in September 2000, include eight broad development goals to be achieved by September 2015. These goals prompted countries around the world to work toward meeting the standards outlined in each of the eight goals and international donors mobilized resources to contribute to meeting the MDGs. Goals related to improving conditions of poverty and hunger, education, gender equality, child mortality, maternal health, HIV/AIDS and malaria, environmental sustainability, and global partnerships for development were established as part of the MDGs (United Nations, 2015).

Millennium Development Goal 2 focuses on education. Specifically, MDG 2 calls for universal primary school enrollment and completion for boys and girls (United Nations, 2015). This MDG and the prevalent notion that education is a critical input for both human capital development and poverty alleviation has caused the education sector to receive substantial attention from the international donor community in recent years.

Status of primary education in developing countries[1]

The timeliness of this report allows for an up-to-date picture of primary education conditions across the developing world. Every five years since the implementation of the MDGs, UNESCO has released a global monitoring report that includes updates on progress toward meeting MDG 2 and trends in education across developing countries. UNESCO's "2015 Education For All Global Monitoring Report" was released in April. This section includes a summary of relevant key findings from this report.

Primary school enrollment is a commonly measured education outcome. The UNESCO Education for All (EFA) report finds that net primary school enrollment rates have significantly improved for many countries over the last two decades, by as much as 20 percentage points in some countries. Fewer children have never been enrolled in school. Most countries have abolished school user fees thus reducing the direct costs to parents of sending their children to school. In addition, we have witnessed a shift in cultural and political attitudes towards free education and greater inclusion in schools.

Despite significant progress in some areas, nearly 58 million children remain out of school, and progress in primary enrollment appears to have stalled in 2007. Equally

[1] All information in this section comes from UNESCO's 2015 Education For All Global Monitoring Report.

troubling is a persistent 20 percent dropout rate in primary schools in 32 countries, most of which are in Sub-Saharan Africa. Many developing countries still have substantial progress to make in achieving universal primary completion, particularly in the poorest communities. Gender, poverty, ethnicity, and location continue to act as barriers to access to quality education services despite significant strides made towards reducing these barriers. The report suggests that the implementation of free and compulsory education policies did not do enough to reduce the real and opportunity costs poor families face in sending their children to school. Additionally, education in complex emergencies requires substantial improvement.

A key focus of MDG 2 and this report is the status of girls' education. Considerable progress has been toward gender parity in primary education. Global and national advocacy campaigns have made positive contributions to toward reducing gender gaps and have spurred policy change related to child marriage and school-related gender-based violence. Importantly, progress has been made in primary education for many countries where girls faced the greatest disadvantage.

Again, despite the progress made in gender parity in education, there is still more to be done. Over 31 million girls remain out of school. In Sub-Saharan Africa, the poorest girls remain the most likely to never enroll in school. The EFA Global Monitoring Report finds that only 70 percent of low-income countries have achieved or are likely to reach gender parity in primary education by the end of 2015. Progress is particularly slow at the secondary level.

Looking forward to the post-2015 Sustainable Development Goals

Given the well-documented benefits of education and the progress still needed in this area, it will continue to be a priority in the SDGs. Coalitions of development and education experts are working diligently to craft recommendations on targets for the new education goals. Prioritizing education as human right and as a necessary component of sustainable development is a central theme across SDG convenings and proposals (Global Campaign for Education, 2015; Education International, 2014; UNESCO, 2015; UNESCO 2013). Equality, completion, inclusion, government capacity, and school quality are also focal points for SDG education considerations (Global Campaign for Education, 2015; Education International, 2014). The SDGs are likely to set considerably higher standards for education progress than the MDGs did in 2000. As these new development goals solidify and move toward fruition, it is important to understand what has contributed, or not, to progress in education outcomes during the span of the MDGs. The remainder of my analysis will consider the role international donors have and could play in progress related to education outcomes in developing countries.

"Not only is education a basic human right, it equips individuals with the knowledge and skills to lead better lives and underpins nations' growth and prosperity. There is thus no question that education must be made prominent in all future development agendas." – *UNESCO 2015*

Chapter 2: International Aid to Primary Education

Between 1999 and 2012, many countries increased their spending related to education and implemented free and compulsory education policies (UNSECSO, 2015). However, education remains a low priority for many national budgets and has not changed much as a share of government spending since 1999 (UNESCO, 2015). In many low-income countries, poor government investment in education increases the costs families face in sending children to school (UNESCO, 2015). For many of the poorest families, even small expenses related to education are not feasible. These financial challenges coupled with chronic issues of the quality of services and government capacity to make improvements, create a need for international support to the education sector in may low-income countries. As a result, aggregate aid to the education sector increased by 1,322 percent between 1993 and 2006 (Asiedu & Nandwa, 2007). The 2015 EFA Global Monitoring Report finds that there is a continued need for aid to education in low-income countries. The following sections outline trends and issues related international aid to the education sector.

I. International aid to education

Trends in aid to education

Donors began to increase their commitments to the education sector in the years leading up to the implementation of the MDGs (UNESCO, 2015). During this time,

international aid generally increased across all sectors. The share of total aid committed to social sectors increased from 31 to 45 percent between 1996 and 2005. The 2000 Dakar Framework asserted that "no countries seriously committed to Education for All will be thwarted in their achievement of this goal by lack of resources," thus encouraging many donors to prioritize education as an area of development (UNESCO, 2015). However, aid to education has never exceeded 10 percent of total aid allocations and has focused almost exclusively on the primary education sector (UNESCO, 2015). Primary education likely attracts significant proportions of aid because of the focus of MDG 2 (UNESCO, 2015; Riddell 2012). Aid to basic education, including primary education, peaked between 2009 and 2010 and fell by 15 percent between 2010 and 2012 (UNESCO, 2015). In 2012, total aid to education was US $12.6 billion, up 41 percent from 2002, but down 4 percent from 2011. Moving into the post-2015 SDGs, we should expect to see growth in private sector involvement in education funding and growth in community and non-formal or non-traditional schooling options often supported by non-governmental organizations (UNESCO, 2015). Given the downward trends in aid and consistent need for improvement in education, it is important to investigate the relationship between aid and education to inform donors' important allocation decisions.

Types of aid to education

Donors provide funding to the education sector through various mechanisms. These modalities include direct general budget support, sector-wide support, and project or program-level support. There is little consensus on the most effective form of donor support to education and the answer likely varies significantly across country contexts.

The sector-wide approach is often highlighted as a more effective way for donors to support education than general budget support or individual programs and projects. This is because this approach allows donors to use various modalities of aid and can create space for programs and projects as well as budget support.

Within sector-wide approaches and program or project-level aid, donors engage in both supply and demand-side funding activities. Supply-side education aid provides resources for government capacity building, school and classroom construction, teacher training and curriculum development, as well as other health and infrastructure sector improvements that may be related to education.

Demand-side education interventions are increasingly used to reduce the real and opportunity costs individual families face in sending children to school. For example, conditional cash transfers (CCTs) have been increasingly used to incentivize poor families to send children, particularly girls, to school by providing financial support to the family in exchange for school participation. While demand-side interventions boast some impressive results, an active debate remains over the use of demand-side interventions by international donors. Research has not yet conclusively determined when demand-side interventions like CCTs and school-meal programs are cost-effective and should be scaled (UNESCO, 2015). Additionally, critics of demand-side interventions argue that limited education resources should not be used to increase demand for education before the quality of services available is adequate enough to produce meaningful learning outcomes for students (Reimers, 2006). Finally, demand-side interventions can be difficult for national governments to fund and manage without

significant financial and logistical support from international donors. Thus, the sustainability of demand-side interventions is cause for caution.

Issues related to aid targeted toward education

The effectiveness of foreign aid generally is a widely debated topic. Aid targeted toward the education sector is no exception. In fact, there is a more substantial body of literature criticizing the shortcomings of education aid than literature exploring aid effectiveness in a concrete way. The literature included in my review revealed four broad criticisms of aid to the education sector:

1) Lack of country ownership
2) Poorly targeted aid and the ability to reach those most in need
3) Lack of coordination between donors
4) Sustainability

I elaborate on each of these issues in the following sections.

Lack of country ownership

Generally, education is regarded as a domestic issue. Many argue that for aid to education to be effective, strong country involvement and ownership are necessary to build the capacity of national governments and achieve sustainable impacts. Kosack argues that for education projects and aid to have sustainable impacts for the education sector, beyond simply constructing schools, it is crucial for governments to possess a strong political will to improve education and the capacity to support and sustain donor funding and projects (2008). Riddell argues that the majority of aid to the education sector is currently fragmented and poorly targeted as a result of inefficient collaboration with host-governments (2012). Many education projects are intended to be long-term

structural changes that mandate government follow-through. However, if a host government does not have the capacity or resources necessary to maintain donor funding levels or donor-run projects, interventions are likely to fail at the conclusion of donor involvement.

Heyneman argues that donors should actively allow countries to prioritize their education needs and should avoid funding things that national governments would fund without donor assistance (2005). When donors directly support national education budgets, countries also run the risk of becoming dependent on donor resources to fund crucial education programs. The often unpredictable nature of donor commitments and disbursements makes it challenging for aid-dependent countries to plan consistent national education expenditures.

Poorly targeted aid, reaching those most in need, and measuring outcomes

Related to the lack of country ownership is the issue of where to target education-related aid. There are two major issues related to targeting aid. The first concerns the countries donors choose to target. Some argue that donors are more likely to provide education-related aid to "low hanging fruit" countries that have substantial political will and positive trajectories related to education absent additional assistance from donors. The second issue is related to the education outcomes donors target and measure.

The issue of targeting "low hanging fruits" is tricky given the necessity of political will and capacity described above. However, critics argue that education needs are often greatest in countries with poor governance and high rates of extreme poverty (Heyneman, 2005). Benavot argues that education aid is currently not effective in serving

the poorest countries, which typically need substantially higher levels of aid to make meaningful progress in education-related outcomes (2010). Fragile and conflict-affected states face considerable challenges to providing education to citizens and refugees. These countries are often highly donor-dependent, but also face the greatest challenges in attracting new aid, leaving certain countries, and underserved groups within countries, struggling to make progress in education.

Serving the most vulnerable groups within countries can be particularly challenging for donors and requires a high level of contextual understanding and careful targeting in order to be effective. Depending on the level at which aid is disbursed, aid to education may not reach the people and communities most in need. Factors that can create barriers to education can also create barriers to the effective delivery of aid. As mentioned in chapter 1, these barriers include severe poverty, gender, caste, ethnicity, disability, and geographic location (UNESCO, 2015). When aid fails to reach these marginalized communities, it can further perpetuate inequality in a country.

Secondly, critics have argued that donors focus too much on inputs and not enough on concrete education outcomes (Riddell, 2012). In recent years, donors have focused disproportionately on improving enrollment rates. Enrollment rates are not necessarily the best measure through which to capture education-related growth. The propensity to focus on enrollment may be partially driven by the focus of the MDGs, but may also be a product of convenience. Changes in enrollment are easy to observe and measure compared to other measures of education, such as literacy. Primary completion is often used as a measure of education quality, and while it might be a more meaningful

measure of education quality than enrollment rates, it still does not capture whether students are learning or benefiting from a higher quality of education. Critics argue that focusing on enrollment rates give donors an "easy way out" by allowing them to report large numbers of children assisted without having to measure and be accountable for changes in quality or attainment (Riddell, 2012). In order to increase the effectiveness of aid to the education sector, donors need to shift their focus toward improving the quality of education and measuring these outcomes.

Coordination between donors

Poor donor coordination is an issue across sectors. Donor coordination has been improving in recent years as a result of multiple international initiatives and frameworks calling for improvements in this area, but remains a challenge nevertheless. In addition to poor coordination between donors and governments, coordination between donors themselves is often cited as a barrier to the effectiveness of aid to the education sector. In the absence of harmonization in aid generally, the efficiency, effectiveness, and sustainability of funding is threatened. Riddell argues that poor donor coordination results in duplicative efforts and leaves gaps in services (2012). Donor coordination levels vary considerably across countries and donor agencies and education service delivery is complex over a child's lifetime. The current status of donor coordination limits donor capacity to ensure adequate support to various levels of education in order to growth at all points in the education trajectory.

Sustainability

Concerns over country ownership, appropriate targeting, and donor coordination lead to questions regarding the sustainability of outcomes related to aid to education. Issues of sustainability relate to country capacity to continue projects and resource allocation funded by international donors once donors are no longer allocating aid to a country's education sector. Key concerns in this area include the amount of funding necessary to spark sustainable outcomes, and the length of funding and projects necessary to ensure sustainability, and the types of funding and projects likely to be sustained by a national government.

The issue of project and funding length is actively debated. Riddell argues that in order for aid to have a lasting impact, it needs a relatively long time frame (2012). She also suggests that aid will be most effective if it's targeted toward the education sector as a whole (Riddell, 2012). A 2010 study commissioned by USAID found a lack of sustainability of shorter-term education projects and argues that long-term support is needed in order for an education intervention to be successful (Gillies, 2010). This report points out that it takes time to build country capacity and buy-in to sustain an intervention. Gillies argues that "best practices" can't merely be transferred from one country to another without the time necessary to be integrated into national education systems and develop national ownership (2010). Benavot also argues that the length of investment is critical to the sustainability of aid (2010).

What donors fund also impacts the sustainability of the intervention and outcomes. In recent years, conditional cash transfers (CCTs) have been a popular

demand-side intervention often used to incentivize families to send girls to school. Riddell argues that when CCTs and other similar interventions are donor-driven they typically fail to have sustainable impacts on education outcomes (2012). Additionally Benavot argues that donors targeting education need to address the underlying factors that may create barriers to sustained education outcomes (2010). He identifies health and food security conditions as critical to the success of education interventions (Benavot, 2010). If donors continue to allocate aid to education without simultaneously addressing additional important factors that limit access to and successful completion of education, this aid will likely not have the sustainable impacts we hope to see for aid allocated to the education sector. In the absence of being able to demonstrate sustainability, donors are also likely to move funding away from the education sector, potentially missing important opportunities to improve education conditions for those most in need.

These issues lead us to wonder what aid to education has been able to accomplish in the face of so many shortcomings. Few studies have critically analyzed the relationship between aid to education and the education outcomes measured in the MDGs and EFA Global Monitoring reports. In an attempt to add to the limited literature base on this topic, the following chapter provides an empirical analysis of aid targeted to the primary education sector's relationship to primary education outcomes.

"No country can really develop unless its citizens are educated."

– Nelson Mandela

Chapter 3: Empirical Analysis of International Aid to Primary Education

I. Introduction

Much of the existing literature related to the effectiveness of aid to education focuses on projects and programs (UNESCO, 2005). There are few studies that consider the effectiveness of aid to the education sector broadly and no studies that I am aware of that consider the effects of aid across the education sector on outcomes for boys and girls separately. This analysis focuses specifically on aid targeted toward primary education for several reasons. First, as discussed above, MDG 2 called for universal primary education enrollment and completion for both boys and girls. Second and relatedly, donors prioritized basic and primary education in education aid allocation throughout the duration of the MDGs. However, the literature related to whether the aid targeted toward primary education was effective is sparse. Finally, primary education is still a major concern for many countries facing high rates of extreme poverty and will continue to need improvements as we move toward the post-2015 Sustainable Development Goals. While this analysis does not shed light on the sustainability of aid to primary education, it provides some information on the relationship between aid specifically targeted toward primary education and primary education outcomes.

II. Existing literature on the effectiveness of aid to education

Summary of literature related to aid to education generally

As mentioned above, the literature base related to the effectiveness of aid to the education sector is quite limited. Few studies have looked systematically at aid to education as an important supply-side factor to consider. Many of the existing studies look at the relationship between aid to education and economic growth, not specifically the relationship between aid and education outcomes.

Asiedu and Nandwa find that the effect of aid to education varies by income as well as by type of aid (2007). Specifically, they find that increased aid to primary education in low-income countries has the highest returns to economic growth (2007). Petrakis and Stamatakis also find that investing in primary and secondary education in least developed countries has high returns to economic growth (2001). These authors' theories consider how aid to education leads to economic growth. The assumption made in these theories is that aid to the education sector will lead to increased participation in and quality of education and thus produce a more skilled labor force better equipped to contribute to economic growth. My analysis focuses on the middle piece of this causal chain by looking specifically at the relationship between aid to education and education outcomes.

Several pervious studies have considered this relationship. Benavot argues that educational progress in developing countries depends largely on aid coming in from international donors (2010). Riddell finds that aid has made positive contributions, particularly towards expanding enrollments (2012). Several studies have found

statistically significant relationships between aggregate aid to the education sector and rates of primary school enrollment (McMahon 1999; Michaelowa & Weber 2007; Dreher et al 2008). In their study of aggregate aid to education, Michaelowa and Weber find that, "An increase in aid for education by one percent of a recipient country's GDP implies an increase in primary completion rates by 1.6 percentage points per year" (2007). Dreher et al finds that higher per capita aid to education increases school enrollment and moderately but significantly contributes to achieving MDG 2 (2008). Specifically Dreher et al finds that increasing aid to the education sector by one percent of a country's GDP leads to an increase in enrollment by 2.5 to 5 percentage points (2008). Dreher et al also finds that an additional dollar per capita of education increases school enrollment by about 0.3 percent.

Not all studies have found a relationship between aid to education and education outcomes. Christensen et al, look specifically at the relationship between aid targeted toward primary education and primary education outcomes (2011, 2012). Specifically, they claim that, "Education aid dollars have no significant impact on education outcomes in less-developed nations" (2011, 2012). Their 2011 study argues that issues of adverse selection related to governance and national capacity create problems for the allocation and effectiveness of aid (Christensen et al, 2011).

The ambiguous findings of prior studies suggest that more investigation is needed to understand the mechanism and outcomes of aid to education. This study begins to fill the gap by investigating the relationship between primary aid to education and primary

enrollment rates overall, as well as separately for boys and girls. The following section outlines the specific statistical models used in previous studies to inform my work.

In the fourth section, I use a country and year fixed effects model on an international, longitudinal dataset to assess the relationship between aid to primary education and boys and girls enrollment rates in low and low-middle-income countries. My study contributes to the existing literature by looking explicitly at the relationship between aid to primary education and outcomes for boys and girls separately. My overall model differs from existing studies in several important ways: First, I use the AidData database, described in greater detail below, which includes information from a larger sample of donors than the CRS / OECD database used by Dreher et al (2008) and Michaelowa and Weber (2007). Second, I examine aid specifically targeted to the primary education level on primary education outcomes as opposed to total education aid. Only Christensen, et al has considered this level of analysis previously (2011). However, my model differs from Christensen et al's, in several important ways including the use of country fixed versus random effects. Most importantly, I examine the relationship between aid and primary education outcomes separately for boys and girls, which has not yet been done in the existing literature. I find that aid to the primary education sector is a statistically significant predictor of enrollment rates for both boys and girls in low and low-middle-income countries. The effect-size for boys and girls is similar, but aid to education explains more of the variation in girls' enrollment than boys', which suggests that on average aid may have reduced gender gaps as well as increasing total enrollment.

III. Statistical models and variables used in existing studies

Given the limited availability of previous literature, the debates about appropriate methods for measuring the impact of aid to education on education-related outcomes are still young and evolving. In this section, I outline the methods used in the existing literature and provide a description of the model and statistical approach I use for my analysis.

Dependent Variables

Measuring education outcomes can be challenging given the availability of data and the timeframe in which changes take place. Enrollment rates, primary completion, and literacy rates are common outcome variables used to measure the success of education interventions. Thus far, all existing studies have focused on net primary enrollment rates[2] as the dependent variable to measure the effectiveness of aid to the education sector (Dreher et al 2008; Michaelowa & Weber 2007), Christensen et al (2011). There are several reasons why primary enrollment has been used to measure aid effectiveness. First, universal primary school enrollment is an important part of the MDGs (Dreher et al 2008; Christensen et al 2011). This makes it an important variable to study and an attractive outcome for donors to support. We know that a substantial amount of international aid has been targeted toward achieving this goal and would expect that if a relationship between aid and education outcomes exists, we should observe an association between aid to education and primary enrollment levels. Additionally,

[2] Net primary enrollment is measured by the percentage of primary-school-aged children enrolled in primary school. This measure does not include older students who may also be enrolled in primary school.

Christen et al (2011), points out that data on primary school enrollment rates is often more widely available than data on other education outcomes.

Despite the exclusive use of primary school enrollment rates in previous studies, the literature simultaneously acknowledges the limitations of this outcome variable. Benavot argues that donors have placed too much emphasis on enrollment and have likely missed opportunities to improve more substantial education outcomes like primary completion and literacy rates as a result (2010). Benavot fears that continuing to use primary enrollment as a key dependent variable measuring the effectiveness of international aid will perpetuate the trend of over-prioritizing enrollment rates at the expense of other potentially more important outcomes (2010). An additional challenge in using net enrollment is that this measure is limited to the percentage of primary-school-age children enrolled in school and does not capture enrollment of older students who may be catching up in primary school. Given the prevalence of the implementation of free and compulsory education policies during this time, we may be missing a significant number of primary school enrollees during this period if these policies encouraged older children to enroll in primary school who were previously unable to afford to enroll in a fee-based system.

Dreher et al (2008) and Michaelowa and Weber (2007) also suggest that an exclusive focus on primary enrollment rates may detract attention from to improving the quality of schooling and suggest using primary completion rates as an alternate measure of the effectiveness of aid. Riddell (2012) cautions against the use of a primary completion measure due to the potential of incentivizing schools to pass students through

grades to achieve completion without actually making academic gains. Michaelowa and Weber (2007) suggest using gender ratios and youth literacy rates as outcome variables. Christensen, et al (2011), also recommend youth literacy rates, but find that the availability of data is too sparse to use meaningfully in most models.

Previous studies have not considered the impact of aid to education separately for boys and girls outcomes. This is an important consideration given the priority the international community and MDGs have placed on improving gender parity in education. This is also important because some theories predict that education interventions will differ in effects across genders (Glick 2008; Herz & Sperling 2004). Gender equality will continue to be a priority for international donors and the post-2015 Sustainable Development Goals and it is therefore important to address this gap in the literature.

The sparse existing literature, criticism of the use of enrollment rates, and the lack of substantial and reliable data for other outcomes makes choosing a specific dependent variable challenging. Due to the lack of available quality data related to youth literacy rates, I will examine net primary enrollment disaggregated by gender. This will not allow for an in-depth analysis of the impact of international aid on important long-term human capital indicators, but will allow for initial observations of international aid's relationship to education outcomes and will provide a starting point for future studies to analyze the relationship between aid to education and gender-specific education outcomes.

Independent Variables

Previous studies have used per capita aid to the education sector as the independent variable in order to control for varying population sizes across countries (Dreher et al 2008; Christensen, et al 2010; Michaelowa & Weber 2007). The Dreher et al (2008) and Michaelowa and Weber(2007) studies used the aggregate amount of aid to education and considered the impacts on primary school enrollment rates. Christensen et al (2010) used disaggregated aid to measure the impact of aid specifically targeted toward primary school on primary education enrollment outcomes. Christensen, et al do not find a significant relationship between per capita aid to primary education and primary enrollment, while Dreher et al (2008) and Michaelowa and Weber (2007) do find a significant relationship between aggregate aid to education and primary school enrollment rates.

It is worthwhile to consider the funding to different levels of education, though it is outside the scope of my analysis. Lavy finds that the opportunity to go to secondary school may be a consideration for parents and students in the cost-benefit decision regarding primary school enrollment (1996). Thus, the discrepancy between findings in the studies above may suggest that aid targeted toward creating opportunities to pursue secondary school or build education capacity in the form of teacher training or facility improvement, which are not included in primary education aid measures, may have important impacts on primary school enrollment rates. Given null findings in Christensen, et al's study and the differences in our model design, I examine aid targeted specifically to primary education and do find significant positive results.

Control Variables

Based on findings in the existing literature described below and the availability of data, I control for per capita income, income-level status, national expenditure on education, child mortality, access to an improved water source, adult literacy, and governance.

Level of Development

The literature suggests that aid to education may have differing impacts on education outcomes based on a country's level of development due to differences in baseline education levels and the availability of complements to education like demand for a skilled labor force (Asiedu & Nandwa 2007; Christensen et al 2010; Petrakis & Stamatakis 2001). Consistent data on poverty rates over the last 20 years is difficult to find. To address this, previous studies have used per capita GDP and per capita income as proxy measures of poverty and development (Christensen, et al 2010; Dreher et al 2008). Christensen, et al suggests that including per capita income as a proxy for poverty levels is important because families facing higher levels of poverty likely face higher opportunity costs of sending children, particularly girls, to school (2010). It is important to note that per capita income is not an ideal proxy for poverty. It has the potential to mask income inequality between men and women and may skew our understanding of those facing the most extreme poverty.

Both of the studies that included per capita income as a control variable found that it was a statistically significant predictor of education. Given the availability of this data and previous findings of its significance, I initially include per capita income in my

models. However, due to issues of multicollinearity and insignificance, I eventually excluded it from my analysis, which includes country fixed effects. In order to partially capture variation across levels of development and better understand the ways in which poverty levels may influence the effectiveness of aid to the education sector, I ran separate model specifications for low-income countries and the full sample including both low and low-middle-income countries.

Child Mortality

As mentioned in chapter 2, child health is an important pre-condition for successful education interventions. In the absence of proper health, children will be unable to participate in education opportunities, regardless of the quality of education services available. To address the relationship between health and education, previous studies have included child mortality as a measure of child health and argue that it is an important predictor of primary school enrollment (Riddell 2012; Christensen et al 2011). Christensen et al finds this to be statistically significant (2012). I include under-5 child mortality rates in my models. Child mortality is measured as the number of deaths per 1,000 live births (World Bank, 2015)

Access to clean water and appropriate infrastructure

Controls for access to an improved water source and other infrastructure may also be important to include due to their impact on opportunity costs of sending children to school. The literature suggests that girls are disproportionately affected by a lack of access to clean water and may be unable to attend school due to time consuming tasks related to fetching and sanitizing water (Stromquist, 1989). Similarly, infrastructure

including safe roads to get to schools may impact enrollment, and again, these impacts may be particularly important for girls (Christensen et al, 2010). Access to clean water and infrastructure were not controlled for in previous studies due to a lack of availability of substantial data. I was not be able to control for general infrastructure, but did control for access to an improved water source using data for the World Bank's World Development Indicators data.

Adult Literacy

Adult literacy is often considered an important predictor of education outcomes, with higher levels of adult literacy being associated with improved education outcomes for children. Educated adults are expected to invest more in their own children's education, creating a cycle of growing human capital across generations. Dreher, et al (2008) and Christensen, et al (2010) find that adult literacy is not a statistically significant predictor of primary school enrollment when country fixed effects are included. This means that there are other unobserved country characteristics that are correlated with adult literacy. Christensen, et al argues that there is a high potential for multicollinearity between enrollment rates and adult literacy rates (2010). I may disagree with Christensen, et al's argument because the increase in international resources targeted toward education and new policies creating free and compulsory education during the 20 years covered in my analysis may create generational gaps in achievement, thus reducing the issue of multicollinearity. Additionally, controlling for parental literacy also addresses the issue of donors targeting "low hanging fruit", or countries already on track to meet education goals, by controlling for parents' propensity to have educated their children in the

absence of aid. In order to observe whether adult literacy remains an important predictor of enrollment in low and low-middle-income countries, I include it in my models.

Population

Previous studies hypothesized that large populations can put pressure on education systems which can impact enrollment by limiting the spots available for students. However, it would more likely that a large population would create diseconomies of scale by negatively impacting the quality of available schooling and in turn, negatively impact completion, literacy, and dropout rates (Dreher, et al 2008; Christensen 2010; Michaelowa & Weber 2007). Dreher et al (2008) and Christensen et al (2010) included controls for the size of the school-aged population in each country, but did not find statistically significant results. I chose not to include school-age population because this is more likely to capture demand for education rather than the overall spread of a nation's resources. To capture the latter, I include total population.

Supply-side inputs

Supply-side inputs like the availability of resources for education and the quality of schools influences school participation. Dreher et al (2008) suggests that supply-side inputs including student-teacher ratios and national expenditures on education may be important predictors of enrollment rates. However, supply-side factors may also attract aid and be affected by the presence of aid. Dreher et al found no relationship between national expenditure on education and enrollment rates (2008). Dreher et al also suggests that student-teacher ratios may serve as an indicator for the quality of education available and may influence parents' decisions about whether or not to enroll or send their children

to school (2008). However, it is difficult to untangle the relationship between supply-side inputs, aid, and individual outcomes for students. I initially included national expenditure on education in my model, but later excluded it due to substantial missing data. It would be useful for future studies to look further into the role that school quality factors play in interacting with aid to improve education outcomes.

Governance

Issues related to governance may affect both national education capacity and aid flows. If a national government faces severe instability, it may be unable to deliver quality education services to its citizens, which in turn creates a greater need for international support to the education sector. However, countries facing considerable issues related to governance will also likely face challenges in attracting international aid. Previous studies include various indicators of governance to try to parse out the relationship between governance, aid, and education.

Controls for governance are statistically significant in predicting enrollment in all previous studies I reviewed (Asidedu & Nandwa 2007; Kosack 2005; Michaelowa & Weber 2007; Christensen et al 2011). The two most common indicators for governance used in previous studies are Polity 2 and International Country Risk Guides (ICRG) corruption scores. Polity 2 provides a scale score for democracy levels ranging from -10 to +10 with -10 representing highly authoritarian governments and +10 representing the highest level of democracy. The ICRG provides a measure of corruption level ranging from 1 to 6 with higher values representing lower levels of corruption. Christensen, et al (2010) finds the Polity 2 democracy indicator and the ICRG corruption indictors to be

significant predictors of both enrollment rates and aid allocated to primary education. However, Michaelowa and Weber (2007) and Dreher et al (2008) argue that indicators of governance may be more highly correlated with aid allocation than with primary school enrollment. Due to the consistent significance of governance indicators this variable and their potential relationship with both education outcomes and aid allocation, I include both the Polity 2 and ICRG scores in my model. Additionally, I include the Freedom House index score as a predictor variable. The Freedom House index provides a scaled score of political rights and civil liberties ranging from 1 to 7 with 1 representing the highest level of political freedom.

It's important to note that these governance indicators had substantial missing data. It is also important to note that much of this information is not missing at random, causing some concern of over the accuracy of predictions using this information. Countries with no information in the Freedom House index or the ICRG Corruption index over the last 20 years, like Russia, Egypt, Democratic Republic of Congo, and Venezuela, may suggest severe issues of governance. While I still include these indicators in my model, it is important to keep this issue in mind in attempting to understand the ways in which very poor governance affects education. I include dummy variables for the missing values to address this issue and preserve the sample size.

Additional Factors and Omitted Variable Bias

In addition to the control variables above, there are other variables that likely influence primary school enrollment for boys and girls. For example, Dreher et al (2008) includes a control variable for international crises under the assumption that crisis

situations could impact both the supply and demand for education. Additionally, a key event to be aware of is the abolition of school fees, which was a relatively common event for many developing countries during the implementation of the MDGs. Riddell (2012) suggests that these events could complicate our understanding of the impact of aid on education because 1) they likely cause a spike in enrollment rates independent of aid and 2) could cause a spike in donor aid to education in order to capitalize on the gains that can be made as a result of the sudden availability of more cost-effective education opportunities. Riddell's work observed this trend of increased aid to education following the abolition of school fees in Burundi, Ethiopia, Ghana, Kenya, Mozambique, Malawi, Nepal, and Tanzania (2012), which makes it difficult to determine causation of increased enrollment. Other observed omitted variables include religion, level of urbanization, various supply-side factors, and the quality of the labor market that influences the incentive to attend and complete school.

Given that there are a number of variables theory suggests may be important predictors of enrollment levels that I did not have adequate data for, there is potential for omitted variable bias. To account for country specific variables that likely do not vary over time, like religion, I use country fixed effects. These models are discussed in greater detail below. While this does not fully solve the problem of potential omitted variable bias, this allows for some control over unobserved variation between countries.

Statistical Models

The existing literature finds some evidence of diminishing returns to aid to education (Michaelowa & Weber 2007; Riddell 2012; Christensen et al 2010). This may

suggest a need for a non-linear approach. Michaelowa and Weber (2007) and Dreher et al (2008) suggest using aid squared to test for diminishing returns. Three of the previous studies use panel data including variables for low-income countries over a number of years (Michaelowa & Weber 2007; Dreher 2008; Christensen, et al 2010). Dreher et al uses pooled time series regressions with the log of primary school enrollment as the dependent variable and aggregate five-year averages of aid to education as the independent variable (2008). With this approach, Dreher et al finds a statistically significant relationship between increases in per capita aid to education and increases in school enrollment (2008). Using a similar approach, Michaelowa and Weber also find a statistically significant relationship between higher per capita aid to education and increases enrollment (2007).

Christensen, et al use panel data and HLM models to test the relationship between aid to primary education on primary education enrollment rates (2011). To account for the time between the disbursement of aid and the time it takes for aid to have an effect on the ground, they use lags between one and five years (2011). Christensen et al find that the latent-growth curve models better capture changes in enrollment overtime by allowing intercepts and slopes and vary across time periods and countries (p. 12) which they feel better models the actual behavior of enrollment-rate growth (2011). However, this study did not find that aid to primary education is significantly related to education outcomes. In my model, I use net primary enrollment rates for each year between 1990 and 2010 and include country and year fixed effects.

IV. Data and statistical models

Data and Variables

The panel dataset includes data from 135 countries from 1990-2010. Countries were included in the sample if they were classified as low or low-middle income in the baseline year of 1990 and had relatively consistent data. I restricted my sample to low and low-middle-income countries primarily because enrollment rates quickly approach 100 percent in higher income countries, and my policy focus is on the effectiveness of aid in high poverty countries. The World Bank classifies a country as "low-income" if the GNI per capita is $1,045 or less and as "low-middle-income" is the GNI per capita is between $1,046 and $4,125 (World Bank, 2015).

Data for this study comes from the AidData 2.1 database (Tierney, et al 2013), the World Bank's World Development Indicators (World Bank, 2015), the ICRG Corruption index (PRS Group, 2011), and the Freedom House Index (Freedom House, 2015). The AidData database includes project-level information about the funding activities of over 80 donors including both bilateral and multilateral agencies from the 1940s through 2010. This data source allowed me to identify any donor commitments to the primary education sub-sector from 1990 through 2010 for the 135 countries included in my analysis.

For my outcome variable, I include aggregate adjusted net enrollment rates and disaggregated net enrollment for boys and girls. Using the low-income indicator variable, described below, I created separate variables for enrollment in low-income countries for total, boys', and girls' enrollment. The models I examine test the relationship between aid

to primary education separately for overall enrollment, girls' enrollment, and boys' enrollment.

For this analysis, I adopt Christensen et al's definition of aid to primary education as the nominal commitment amounts reported for each project coded as primary education aid in the AidData system (Christensen et al, 2011). The AidData system includes both commitment and disbursement amounts for many projects, though not all. Previous studies indicate that commitments are a reliable predictor of disbursements (Christensen et al, 2011; Nielson & Tierney, 2005; Wilson, 2009). Data is more widely availability for commitment amounts so I include commitments rather than disbursements in my analysis. This is consistent with Christensen et al's work (2011). Due to concerns of nonlinearity, I use the log of per capita aid to primary education.

To determine whether a country was considered low-income in 1990, I used per capita income measured in current US dollars and created a dummy variable to identify whether a country was low-income in the baseline year. I include the log of per capita income in my initial models, but eventually exclude it due to issues of multicollinearity. I also created regional dummies for East Asia, Eastern Europe and Central Asia, Latin America, Middle East and North Africa, South Asia, and Sub-Saharan Africa.

Additionally, I include child mortality, the log of population, adult literacy, and national expenditure on education from the World Development Indicators. Child mortality is measured as the number of deaths per 1,000 live births. National expenditure on education is measured as expenditures dedicated to the education as a percentage of the national budget (World Bank, 2015). Following the existing literature, I used the

International Country Risk Guide (ICRG) Corruption Index, the Freedom House index, and the Polity 2 index as proxies for governance. Income per capita, access to an improved water source, national expenditure on education, and the Polity 2 score were ultimately excluded from the models due to issues of multicollinearity.

Addressing missing data

Given the nature of historical data from developing countries, there is substantial missing data across the dataset. Some of the missing observations are random, while others are not, like the consistent absence of democracy indicators for some countries. This creates challenges in maintaining similar sample sizes across model specifications. To deal with this, I recoded missing observations to 0 values and created dummy "missing" variables to include in my regressions in order to preserve the sample size and address the issue of missing data. Variables that required the addition of a missing dummy include adult literacy, corruption, and Freedom House index scores.

Descriptive Statistics

More than 50 percent of the countries in the sample were classified as low-income countries in 1990. Not surprisingly, Sub-Saharan Africa is the most common region in the dataset. Average net enrollment across the sample ranges from 19 percent to 100 percent, dipping as low as 14 percent for girls between 1990 and 2010. The changes in enrollment were larger for low-income countries than low-middle income countries and changes for girls were larger than for boys across income categories. These changes were most pronounced in Sub-Saharan Africa, though the largest gap in average changes

between boys and girls is found in South Asia average. Per capita aid to primary education ranges from nearly US$0 to $188.

Table 1 displays average descriptive statistics for key variables of interest by region from 1990 to 2010. Sub-Saharan Africa has the lowest average income per capita, the highest child mortality rate, the lowest adult literacy levels, as well as the lowest average enrollment rates across categories. East Asia received the largest amount of per capita to primary education.

Table 1: Average summary statistics by region

Variable	East Asia	Europe / Central Asia	Latin America	Middle East	South Asia	Sub-Saharan Africa
No. of Countries	17	25	28	13	8	44
Income*	$1,303	$2,796	$2,885	$2,768	$759	$739
Primary Aid/capita	$3.84	$0.59	$3.57	$1.77	$2 .09	$2.14
Child Mortality**	50	31	34	43	85	134
Adult Literacy	85%	97%	90%	72%	66%	55%
Net Primary Enrollment: Total	92%	94%	93%	83%	84%	69%
Girls	89%	93%	93%	77%	80%	65%
Boys	91%	94%	93%	83%	85%	70%

* Per capita measured in current US dollars
** Child mortality measured in under-5 deaths per 1,000 live births

Table 2 displays the same average summary statistics for the full sample and for the low-income portion of the sample.

Table 2: Average summary statistics for low-income countries and the full sample

Variable	Low-Income Only	Whole Sample
No. of Countries	82	135
Income*	$745	$1,813
Primary Aid /capita	$2.18	$2 .46
Child Mortality**	99	72
Adult Literacy	68%	76%
Net Enrollment: Total	77%	83%
Girls enrollment	72%	80%
Boys enrollment	77%	83%

* Per capita measured in current US dollars
** Child mortality measured in under-5 deaths per 1,000 live births

In order to assess whether there are differences between boys and girls enrollment in countries in included in the sample, I ran t-tests. This revealed that there were statistically significant differences between boys and girls enrollment throughout the duration of this analysis, though the gap did narrow across all regions between 1990 and 2010. These differences confirm the necessity to look separately at boys and girls enrollment across model specifications.

Model

Each of my models includes net primary school enrollment and the log of primary aid to education. When I discuss the effects of aid to primary education, I am discussing this in terms of elasticities in that I'm referring to a one percent increase in aid as opposed to a one dollar change in aid. The first model I examined was a basic OLS regression model including enrollment and the log per capita primary aid to education overtime, outlined on the next page, on a pooled sample of countries from 1990 to 2010.

Basic OLS Model: $Y = \beta_0 + \beta_1 X_1 + E$

Where: Y= Adjusted net enrollment (for the overall sample, girls only, and boys only)

β_0 = Constant

$X_{1=}$ Log of aid to primary education

E= Error

I ran this model separately for boys and girls. This was repeated again and restricted to the subsample of low-income countries. The results of this model are included in Table 3.

Table 3. OLS Estimates of the Effect of Primary Aid on Primary Enrollment

OLS Low Income Countries				**OLS Full Sample**			
	(1)	(2)	(3)		(1)	(2)	(3)
Enrollment	Overall	Girls	Boys	Enrollment	Overall	Girls	Boys
Primary aid	-1.40**	-1.35**	-1.06**	Primary aid	-1.38**	-1.51**	-1.25**
	(0.36)	(0.42)	(0.36)		(0.24)	(0.29)	(0.24)
_cons	76.19**	71.97**	76.65**	_cons	80.95**	77.67**	81.03**
	(0.82)	(0.95)	(0.80)		(0.63)	(0.74)	(0.62)
N	702	619	619	N	1036	911	911
R2	0.0209	0.0159	0.0137	R2	0.0306	0.0286	0.0276

The results above show a significant negative relationship between aid to primary education and enrollment rates for the full and low-income restricted samples. According to this model, a one percent increase in aid to primary education will result in a reduction in enrollment. This counterintuitive result suggests the need for a different model. Basic assumptions of OLS models include that error terms are uncorrelated and may contain

factors that could bias results. Given that this sample includes the same countries over a 20-year period, the OLS assumption of uncorrelated error terms is likely violated. This model may be capturing additional country-level factors that attract aid, but also drive enrollment down like poverty and infrastructure, thus biasing the results. These concerns necessitate a fixed effects model.

In order to capture unobserved variables that vary across countries and between years within countries, I use fixed effects models with clustered standard errors for the remainder of this analysis. The dependent variables in these models were enrollment rates overall and enrollment rates separated by gender. I ran each model twice, once for the overall sample and once restricted to low-income countries. The independent variables varied across models with the key independent variable being the log of per capita aid to primary education in each model. The general equation for these models is as follows:

$$\text{Fixed effects model: } Y_{it} = \beta_1 X_{1i} + \beta_2 X_{2i} + \alpha_I + u_i$$

Where: Y= Adjusted net enrollment (for the overall sample, girls only, and boys only)
i= Countries
t= time
$X_{i=}$ Coefficient for independent variable in individual countries (i)
$\alpha_{i=}$ country fixed effect; year fixed effect
$u_{i=}$ Random error across countries (i)

When using net enrollment as an outcome variable there is a ceiling effect. Net enrollment will not go above 100 percent. After running several specifications of Fixed Effects Model 1, I chose to restrict subsequent models to countries with enrollment rates of less than 90 percent in order to capture countries in need of improvement to

enrollment. The specifications for my fixed effects model are outlined below. Results are displayed and discussed in the results section.

Fixed Effects Specification 1: Enrollment and aid to primary education

Fixed Effects Model 1 is an OLS model with country and year fixed effects and clustered standard errors including aid to primary education as a predictor variable. I ran this specification a total of 18 times with slight modifications to capture differences between subsamples of gender, income status, and enrollment rate levels. I included specifications for the full sample as well as specifications restricted to countries with less than 90 percent enrollment and again for countries with less than 50 percent enrollment in an attempt to observe the diverse effects of aid on countries with differing levels of enrollment.

Fixed effects specification 2: Aid to primary education, population, child mortality, and adult literacy

Fixed Effects Model 2 is a country and year fixed effects model with standard errors clustered by country. This specification was restricted to countries with enrollment rates of less than 90 percent. It includes aid to primary education as the key predictor variable, but also includes control variables for the log of population, child mortality, and adult literacy. Due to substantial missing data for the adult literacy variable, I generated a dummy variable for missing data and included it in the model as well to preserve the sample size. I ran this model six times with slight modifications to observe the same subsample differences in gender and low-income status as in the previous model.

Fixed effects specification 3: Aid to primary education, population, corruption, and Freedom House index scores

Fixed effects Model 3 explores the relationship between enrollment and aid to primary education, controlling for population and governance indicators. This is a country and year fixed effects model with clustered standard errors by country, restricted to countries with enrollment less than 90 percent. To capture issues of governance that may influence both the allocation of aid and the quality of education available in a country, I included the ICRG corruption index score and the Freedom House index score, discussed in detail in the previous section. I also included dummy variables for missing data in both the ICRG corruption score and the Freedom House data points. As mentioned above, consistent missing values for this variable may not be random and could indicate very low levels of governance. I ran this specification six times with slight modifications to observe the same subsample differences in gender and low-income status.

Fixed effects specification 4: Aid to primary education, population, child mortality, and corruption scores

The final model is Fixed Effects Model 4. Similarly to Fixed Effects Models 2 and 3, this is a country and year fixed effects model with standard errors clustered by country and restricted to countries with less than 90 percent enrollment. Similarly to the models described above, I ran this model 6 times to capture variation across income level and gender. This model includes aid to primary education as the key predictor variable and includes controls for the log of population, child mortality, and the ICRG corruption

rating. This model also included a dummy variable to capture missing values for the corruption rating.

V. Results from statistical models

Table 4 includes the results from the first fixed effects Model 1 for the full sample and separately for low-income countries. Models A and B show that primary aid to education is a statistically significant predictor of enrollment rates. This model suggests that a one percent increase in per capita primary aid to primary education will result in a 0.30 percentage point increase in education for low-income countries and a 0.35 percentage point increase in overall enrollment for low and low-middle income countries on average. In this model, the effects of a one percent increase in per capita primary aid to education are strongest for boys in low-income countries as evidenced by the coefficient of 0.57. In comparing this first fixed effects specification to the original OLS model without fixed effects, we find that the direction of the coefficients has reversed. This suggests that there are in fact important country-level factors to control for in this model and confirms the need for a fixed effects approach.

The following four specifications are restricted to countries with 90 and 50 percent overall enrollment respectively. In the 90 percent enrollment-restricted model, aid to primary education is a statistically significant predictor of enrollment for all specifications at the 1 percent level. It is strongest for girls in 90 percent restricted full sample. The coefficient 0.92 suggests that a one percent increase in per capita aid to primary education will result in a 0.92 percentage point increase in girls' enrollment, a nearly equivalent change, on average.

The two specifications restricted to 50 percent enrollment are the same for the low-income subsample and the full sample. This is because all countries with less than 50 percent enrollment fall into the low-income category thus making the low-income and full model specifications equivalent. With the 50 percent enrollment restriction, we see that aid to primary education is a statistically significant predictor of enrollment for both boys and girls. While this specification allows us to see that aid to primary education can positively impact severely low enrollment rates, we are also looking at a much smaller sample than we are in the previous models and thus should view the results in this model with more caution. These are also likely to be countries that face additional barriers to education like conflict-affected and fragile states.

I examined this specification with a 95 percent enrollment restriction as well to observe the effects with a larger sample size. Variables hold their significance and direction in this specification. Given the similarity of the results from this specification to the those included in Table 4, I have not included the output here.

Table 4: Fixed Effects Estimates of the Effect of Primary Aid on Primary Enrollment in All Countries and Low-Enrollment Countries

Low-income				Full sample			
	(1)	(2)	(3)		(1)	(2)	(3)
Enrollment	Overall	Girls	boys	Enrollment	Overall	Girls	Boys
Primary aid	**0.31**	0.48*	0.57**	Primary aid	0.35*	0.43**	0.47**
	(0.19)	(0.20)	(0.18)		(0.13)	(0.16)	(0.14)
_cons	63.65**	60.18**	68.98**	_cons	72.64**	71.56**	76.51**
	(4.29)	(6.24)	(5.78)		(3.64)	(4.43)	(3.67)
N	702	619	619	N	1036	911	911
R2				R2			
Within	0.4846	0.5336	0.4609	Within	0.384	0.4192	0.369
Between	0.0482	0.0523	0.0394	Between	0.0286	0.0245	0.0177
Overall	0.1203	0.1264	0.1128	Overall	0.0848	0.0845	0.0775
FE	Yes	Yes	Yes	FE	Yes	Yes	Yes
Low-income countries with less than 90 percent enrollment				**Full sample of countries with less than 90 percent enrollment**			
	(1)	(2)	(3)		(1)	(2)	(3)
Enrollment	Overall	Girls	Boys	Enrollment	Overall	Girls	Boys
Primary aid	0.68**	0.74**	0.73**	Primary aid	0.84**	0.92**	0.84**
	(0.20)	(0.24)	(0.21)		(0.24)	(0.27)	(0.23)
_cons	48.36**	48.24**	55.70**	_cons	56.92**	59.62**	63.58**
	(2.58)	(3.57)	(3.21)		(3.80)	(4.00)	(2.93)
N	426	411	411	N	502	482	482
R2				R2			
Within	0.6374	0.645	0.5689	Within	0.5702	0.5822	0.5245
Between	0.0026	0.0001	0.0003	Between	0.0065	0.0013	0.0022
Overall	0.1094	0.1096	0.1017	Overall	0.0618	0.0671	0.0681
FE	Yes	Yes	Yes	FE	Yes	Yes	Yes

Bold=.10, *=.05, **=.01
Fixed effects included for country and year

Table 4 (Continued): Fixed Effects Estimates of the Effect of Primary Aid on Primary Enrollment in All Countries and Low-Enrollment Countries

Low-income with less than 50 percent enrollment				Full sample of countries with less than 50 percent enrollment			
	(1)	(2)	(3)		(1)	(2)	(3)
Enrollment	Overall	Girls	Boys	Enrollment	Overall	Girls	Boys
Primary aid	**0.56**	0.72*	0.82*	Primary aid	**0.56**	0.72*	0.82*
	(0.28)	(0.25)	(0.34)		(0.28)	(0.25)	(0.34)
_cons	31.62**	21.73**	32.07**	_cons	31.62**	21.73**	32.07**
	(3.42)	(3.07)	(2.15)		(3.42)	(3.07)	(2.15)
N	93	89	89	N	93	89	89
R2				R2			
Within	0.8282	0.848	0.823	Within	0.8282	0.848	0.823
Between	0.0973	0.0635	0.0686	Between	0.0973	0.0635	0.0686
Overall	0.0883	0.1163	0.0864	Overall	0.0883	0.1163	0.0864
FE	Yes	Yes	Yes	FE	Yes	Yes	Yes

Bold=.10, *=.05, **=.01
Fixed effects included for country and year
Low-income and full sample are the same due to 50 percent enrollment restriction

Table 5 shows the results for a specification including country and year fixed effects for enrollment, aid to primary education, child mortality, and adult literacy. I run this specification separately for the full sample and low-income-only samples. These specifications are restricted to countries with less than 90 percent enrollment. Here we see that primary aid to education and child mortality are statistically significant predictors of enrollment rates for boys and girls. Effect sizes are similar between the full and low-income restricted samples. This specification suggests that a one percent increase in per capita primary education aid will result in a 0.4 to 0.5 percentage point increase in enrollment rates for boys and girls. Additionally, it suggests that a one-unit decrease in

child mortality will result in roughly a 0.2 percentage point increase in enrollment across the sample. Population and adult literacy are not statistically significant predictors of enrollment in this specification. The insignificance of adult literacy is consistent with the findings of earlier studies. The R-squared values are larger in this model than in the first fixed effects models that included only aid to primary education as a predictor. This suggests that there are other important predictors of education outcomes not related to aid to primary education. Interesting, the r-squared value is particularly high for girls in the full sample. The r-squared coefficient 0.44 suggests that this model explains about 44 percent of the overall variation in girls' enrollment. This specification also explains about 68 percent of the within country variation in girls' enrollment for low and low-middle income countries with less than 90 percent enrollment.

Table 5: Fixed effects estimates with controls for population, child mortality, and adult literacy[3]

Low-income countries with less than 90 percent enrollment				Full sample of countries with less than 90 percent enrollment.			
	(1)	(2)	(3)		(1)	(2)	(3)
Enrollment	Overall	Girls	Boys	Enrollment	Overall	Girls	Boys
Primary aid	0.45*	0.45*	0.48*	Primary aid	0.42*	0.44*	0.433*
	(0.22)	(0.22)	(0.20)		(0.17)	(0.20)	(0.17)
Population	-9.73	-9.73	-21.79	Population	-1.51	1.35	-12.95
	(30.94)	(30.94)	(18.85)		(21.75)	(28.52)	(17.46)
Child Mort.	-0.22**	-0.22**	-0.21**	Child Mort.	-0.22**	-0.23**	-0.21**
	(0.07)	(0.07)	(0.06)		(0.05)	(0.06)	(0.05)
Ad. literacy	-0.02	-0.02	-0.01	Ad. literacy	-0.008	-0.014	-0.008
	(0.03)	(0.03)	(0.04)		(0.03)	(0.03)	(0.03)
_cons	236.80	236.80	432.53	_cons	110.910	65.940	290.986
	(495.73)	(495.73)	(305.05)		(343.62)	(449.99)	(276.31)
N	411	411	411	N	502	482	482
R2				R2			
Within	0.6994	0.7097	0.6331	Within	0.6784	0.6867	0.6176
Between	0.0155	0.057	0.0028	Between	0.316	0.4363	0.0266
Overall	0.1075	0.1706	0.0061	Overall	0.3937	0.4449	0.0741

Bold=.10, *=.05, **=.01
Fixed effects included for country and year

Table 6 shows the results for the fixed effects specifications including aid to primary education, population, the ICRG corruption score, and Freedom House index score. I ran this for total, girls', and boys' enrollment separately for the full and low-income restricted sample. I also include dummy variables for the ICRG corruption index

[3] A dummy variable capturing missing observations for adult literacy was also included in this model to balance the sample despite missing observations for the adult literacy variable.

score and the Freedom House index score to compensate for missing data in these areas, as described above in the governance section. This specification suggests that corruption and political freedoms are not statistically significant predictors of enrollment. This finding is not consistent with the findings of Michaelowa & Weber (2007) or Christensen, et al. (2011) who found these governance indicators to be a statistically significant predictors of enrollment. However, Dreher argues that governance quality is likely a predictor of aid allocation rather than a predictor of enrollment (2008). To address this possibility, I ran regressions with per capita aid to primary education as the dependent variable and ICRG corruption and Freedom House index scores as predictors. These results were not statistically significant for the full or low-income restricted samples. It is important to note Michaelowa & Weber (2007) and Dreher (2008) were considering overall aid to the education sector and not primary-specific aid. It may be the case that governance becomes more important as aid expands to areas of education outside of the Millennium Development Goals realm. Nevertheless, the governance indicators remain insignificant in this model. This may be because country fixed effects consume the significance of governance indicators which do not vary much, if at all, from year to year.

Table 6: Fixed effects estimates with controls for aid to primary education, population, corruption, and Freedom House index scores[4]

Low-income countries with less than 90 percent enrollment				Full sample of countries with less than 90 percent enrollment.			
	(1)	(2)	(3)		(1)	(2)	(3)
Enrollment	Overall	Girls	Boys	Enrollment	Overall	Girls	Boys
Primary aid	0.56**	0.56*	0.60**	Primary aid	0.74**	0.78**	0.73**
	(0.20)	(0.23)	(0.20)		(0.21)	(0.24)	(0.20)
Population	41.99*	48.45	32.90*	Population	56.87**	62.65*	42.97**
	(18.32)	(27.50)	(12.75)		(19.13)	(25.20)	(14.42)
Corruption	-1.33	-1.46	-1.26	Corruption	-0.24	-0.52	-0.54
	(1.04)	(1.14)	(1.02)		(0.99)	(1.07)	(0.95)
Free.House	0.03	0.14	-0.24	Free. House	-0.37	-0.30	-0.55
	(0.61)	(0.60)	(0.70)		(0.61)	(0.62)	(0.66)
_cons	609.58*	-714.16	459.95*	_cons	825.60**	-914.84*	602.42**
	(288.79)	(434.20)	(201.48)		(298.16)	(393.54)	(225.05)
N	426	411	411	N	502	482	482
R2				R2			
Within	0.6692	0.6805	0.5979	Within	0.6175	0.6319	0.5979
Between	0.0147	0.0027	0.0273	Between	0	0.0041	0.0273
Overall	0.0109	0.0016	0.0271	Overall	0.0009	0.0082	0.0271

Bold=.10, *=.05, **=.01
Fixed effects included for country and year

Table 7 includes the results from the specification including predictors for aid to primary education, population, child mortality, and corruption. Consistently with the specifications above, I ran this separately for the full sample and low-income restricted samples. Consistent with second fixed effects specification, aid to primary education and

[4] Dummy variables capturing missing observations for corruption and the Freedom House scores were also included in this model to balance the sample despite missing observations for these governance variables.

child mortality are statistically significant predictors of enrollment for girls and boys across low and low-middle-income countries. The coefficients for girls and boys are roughly equal suggesting that aid to primary education has a similar effect sizes between genders. Specifically, we can expect a one percent increase in per capita aid to primary education to result in a 0.4 percentage point increase in enrollment for boys and girls on average. However, the r-squared values for girls are substantially higher than they are for boys. For low-income countries with less than 90 percent enrollment, this model explains roughly 28 percent of the variation in girls' enrollment and only 10 percent of the variation in boys' enrollment. For the full sample of low and low-middle-income countries together, this model predicts about 44 percent of the variation in girls' enrollment and only about 6 percent of the variation in boys' enrollment. This suggests that there are additional important factors not captured that contribute more to the variance in boys' enrollment than girls'.

It would be interesting to include variables to examine factors like the percentage of children participating in child labor by gender to observe additional driving factors of enrollment that may disproportionately effect boys' enrollment. Furthermore, this could also be the result of higher baseline enrollment for boys and the addition of aid to primary education, resulting in higher quality education or specific targeting of female students, being more important for the decision for girls to enroll in school. More exploration is needed to identify other factors that influence the propensity of one gender to enroll in school more so than the other.

Table 7: Fixed effects estimations with controls for population, child mortality, and corruption scores [5]

Low-income countries with less than 90 percent enrollment.				Full sample of countries with less than 90 percent enrollment.			
	(1)	(2)	(3)		(1)	(2)	(3)
Enrollment	Overall	Girls	Boys	Enrollment	Overall	Girls	Boys
Primary aid	0.42*	**0.42**	0.45*	Primary aid	0.42*	0.44*	0.42*
	(0.19)	(0.22)	(0.20)		(0.17)	(0.20)	(0.17)
Population	-5.29	-4.09	-17.91	Population	-3.64	-0.67	-14.39
	(22.99)	(30.65)	(19.61)		(21.00)	(27.93)	(17.04)
Child Mort.	-0.19**	-0.20*	0.20**	Child Mort.	-0.22**	-0.23**	-0.21**
	(0.06)	(0.08)	(0.06)		(0.05)	(0.06)	(0.05)
Corruption	-0.40	-0.38	-0.28	Corruption	0.46	0.41	0.29
	(0.84)	(0.92)	(0.87)		(0.72)	(0.83)	(0.74)
_cons	166.52	146.93	371.61	_cons	146.94	100.89	317.10
	(370.18)	(491.87)	(317.91)		(332.09)	(441.54)	(270.30)
N	426	411	411	N	502	482	482
R2				R2			
Within	0.7021	0.7119	0.6366	Within	0.6809	0.6887	0.6206
Between	0.0584	0.1494	0.001	Between	0.2411	0.4141	0.0231
Overall	0.1964	0.2878	0.0112	Overall	0.3455	0.4483	0.0666

Bold=.10, *=.05, **=.01
Fixed effects included for country and year

VI. Conclusions based on statistical findings

The results of this analysis suggest that aid targeted specifically to primary education is statistically and substantively related to enrollment rates for girls and boys in low and low-middle-income countries. This is not consistent of the Christensen, et al's

[5] A dummy variable capturing missing observations for corruption was also included in this model to balance the sample despite missing observations for this governance variables.

findings in their study of aid to primary education (2011). The first fixed effects model without enrollment rate restrictions showed stronger effects for low-income countries than the full sample. The subsequent enrollment restrictions likely excluded many low-middle-income countries from the analysis given the correlation between income level and enrollment. Effect sizes were roughly equivalent for boys and girls ranging from .31 to 0.92 per one percent increase in aid to primary education. The largest coefficient, 0.92, was found for girls across the full sample with the 90 percent enrollment rate restriction. Across 90 percent enrollment-restricted models, the strongest overall r-squared is for girls' enrollment in the full sample suggesting that primary aid to education, coupled with child mortality, explains about 45 percent of the variation in girls' enrollment in low and low-middle-income countries with less than 90 percent enrollment. This analysis suggests that the variables included in this study are important predictors of enrollment.

The differences between my findings and Christensen, et al's (2011) could stem from several factors. First, they use a hierarchial linear model with random effects. My analysis, as well as Dreher (2008) and Michaelowa & Weber's (2007), employ fixed effects models. Both fixed and random effects control for unobserved country characteristics, but only fixed effects allows for interpretation of within-country effects of marginal changes in aid to primary education. Additionally, Christensen, et al (2011) sums aid disbursements over a 5-year period in order to allow for a lag between aid disbursement and effect. Lags make sense if aid is targeted toward projects that take significant amounts of time to complete, like infrastructure and policy reform. However, the AidData system codes education infrastructure projects and education policy projects

separately from aid to the primary education sector. Without considering longer-term infrastructure or major reform projects, there is little reason to believe that it would take a country five years to spend aid targeted toward education and begin to see changes in enrollment. Finally, as discussed throughout my analysis, I look separately at these relationships for low-income countries and the full sample of low and low-middle-income countries and disaggregate my analysis of enrollment outcomes by gender.

VII. Limitations of the statistical models

As discussed in my initial model specification, there are many variables theory suggests may contribute to the effectiveness of primary education aid that I do not have adequate data for. This creates the potential for omitted variable bias. The fixed effects models control for omitted variable bias to an extent, but do not remove the issue completely. Additionally, due to the nature of longitudinal data in developing countries, there is substantial missing data. For variables with missing data, I created a dummy variable in order to preserve the sample size. While I don't feel that this influences the statistical or substantive significance of the aid to primary education variable, it's possible that I was unable to capture the relationship between governance, adult education, or national education expenditures on enrollment rates.

The insignificance and the collinearity of the per capita income variable was also a limitation of this study. Theory, reason, and previous studies suggest that income would be a significant predictor of enrollment rates, however the per capita income variable from the World Development Indicator database included substantial missing observations and was therefore not an effective variable through wish to assess this

relationship. In the future I would like to use additional measure of poverty and further explore the relationships between aid, poverty, and education.

VIII. Suggestions for future studies

Given that few studies related to aid and education have been done, there is substantial room for additional work in this area. The results of this study and those of the other studies discussed throughout this analysis suggest that it would be interesting to use similar models to look at the relationship between aid to additional sub-sectors of education and education outcomes. Michaelowa & Weber (2007) and Dreher (2008) find that a one percent increase in general to education results in a 1.6 to 2.5 percent increase in enrollment. These effect sizes are larger than the effect sizes found in my analysis suggesting that aid to other parts of education may also influence primary school enrollment. It is possible that primary school enrollment is partially determined by the quality of schools available or the opportunity to go to secondary school, which may be related to aid directed towards other parts of the education sector outside of primary education. These relationships were not captured in my analysis.

As discussed earlier, enrollment is only one important education outcome. Ideally, future studies would examine aid to education's relationship to other more substantive education outcomes like primary completion and youth literacy. Additionally, it would be useful to explore whether aid targeted toward girls' education specifically has a statistically significant impact on girls' education outcomes. The AidData database includes project level information that could potentially allow for the coding of projects specifically targeting girls. Additionally, this could allow for the disaggregation of types

of aid projects by coding what the project aimed to do. Existing studies have been limited to the analysis of a specific level of education ie, primary, secondary, or overall aid, and this does not allow for exploration of the different types of projects and how each project contributes to improved education outcomes.

"Education is a human right with immense power to transform. On its foundation rest the cornerstones of freedom, democracy and sustainable human development." – Kofi Annan

Chapter 4: Policy Implications and Conclusions

I. Introduction

Debates around the post-2015 SDGs have fueled discussions related to the need for improved donor coordination, collaboration, and sustainable efforts across sectors. These debates are likely to continue well into the implementation of the post-2015 SDGs. The literature review in this report revealed persistent challenges in improving education for high need areas and marginalized groups and affirmed that significant gender disparities still exist in many low-income countries. My report suggests that international aid to education is positively related to enrollment for boys and girls in low and low-middle-income countries and may contribute to reducing gender gaps in primary enrollment. Using the results of my empirical study to guide my analysis, I draw policy lessons in hopes of contributing to the discussion related to the post-2015 education SDGs by offering suggestions on areas donors can target their efforts to maximize the effectiveness of aid to education. I include three broad recommendations including:

1. Target aid to high need areas
2. Send aid to low-income countries with low enrollment rates
3. Ensure that projects have a specific focus on gender as well as expanded access.

II. Policy implications

Target aid to high need areas

The individual contexts of high poverty countries and communities need to be thoroughly considered in aid allocation decisions. As Riddell points out, one-size-fits all interventions are not effective in achieving meaningful outcomes in education (2012). For some countries, primary school may still be the main priority. For others, secondary education or specific quality improvements may be more important. My analysis suggests that aid targeted to primary education is positively related to primary education outcomes. Given that donor resources can be effective in achieving the outcome they target, donor activities should be targeted to high need countries and communities.

New methods for data analysis can assist donors in their assessment of where and how to allocate aid in a country. It would be beneficial to increase the use of poverty and resource mapping tools to determine the education needs and opportunities of specific communities. This could include geospatial maps identifying disparities in literacy rates, gender equity, and educational attainment coupled with specific locations of schools, aid flows, and other necessary supply inputs to create a visual representation of community needs and supply availability. This would inform donors decisions about the most appropriate form of aid to provide depending on the supply and demand education conditions of the target area. This could also lead to improvements in donor coordination by allowing donors to visually see where others are working and identify gaps more easily. Maps could also enhance countries' abilities to make evidence-based decisions

about resource allocations and could help countries collaborate with donors to strategically plan projects in the appropriate locations.

Send aid to low-income countries with low enrollment rates

While most countries have made significant progress in improving primary school enrollment rates, the 58 million children who remain out of school suggest that many have not made enough progress. Countries that struggle the most in this regard are often conflict and fragile-affected states. My analysis suggests that governance factors including corruption and civil liberties do not interfere with the positive relationship between aid to primary education and primary school enrollment. Thus, donors should continue to target low-income countries with low enrollment rates, even in the face of high corruption levels. This will require donors to be strategic in the mechanisms through which they fund education in difficult contexts, but government corruption and instability should not be viewed as insurmountable barriers to growth in education.

Ensure that projects have a specific focus on gender

Girls' education will continue to be a critical development priority until gender parity is achieved at all levels of schooling. My findings suggest that aid to education may be positively related to reductions in gender gaps in primary school enrollment, though additional empirical work is needed to confirm this. Donors should ensure that gender is a key focus and consideration at the planning, implementation, and evaluation stages of all development activities. It would be useful for the post-2015 SDGs to call for the inclusion of gender components in all development initiatives and project across

sectors to ensure that the needs of women and girls are broadly and consistently addressed.

II. Conclusion

Education will continue to be an international development priority for the foreseeable future. Significant strides have been in education throughout the duration of the MDGs, but there is still significant room for improvement. This report provides some insight into the role that international aid has and could play in continuing to improve access to quality education around the world. My policy recommendations do not call for major reform initiatives. They call for relatively small adjustments to current, proven practices. These adjustments, coupled with continued research and reflection, could have large and important impacts for the children and countries most in need.

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Vita

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